



City of Richmond

Report to Committee

To: Public Works and Transportation Committee
From: John Irving, P.Eng. MPA
Director, Engineering
Date: March 23, 2015
File: 10-6060-03-01/2015-
Vol 01
Re: 2015 Liquid Waste Management Plan Biennial Report

Staff Recommendation

That the "2015 Liquid Waste Management Plan Biennial Report," presented as Attachment 1 to the staff report titled "2015 Liquid Waste Management Plan Biennial Report," dated March 23, 2015, from the Director, Engineering be submitted to Metro Vancouver.

John Irving, P.Eng. MPA
Director, Engineering
(604-276-4140)

| REPORT CONCURRENCE | | |
|--|-------------------------------------|---------------------------------------|
| ROUTED TO: | CONCURRENCE | CONCURRENCE OF GENERAL MANAGER |
| Sewerage & Drainage | <input checked="" type="checkbox"/> | |
| REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE | INITIALS: | APPROVED BY CAO |

Staff Report

Origin

The Greater Vancouver Sewerage and Drainage District (GVS&DD) Board adopted the Integrated Liquid Waste and Resource Management Plan (ILWRMP) in May 2010. Subsequently, at the September 27, 2010 City of Richmond Regular Council Meeting, Council adopted the following motion:

“That the municipal commitments in the Metro Vancouver 2010 Integrated Liquid Waste and Resource Management Plan be endorsed.”

The Minister of Environment approved the ILWRMP, subject to conditions identified in his letter, dated May 30, 2011.

The ILWRMP requires member municipalities to report progress on 27 municipal commitments on a biennial basis. Metro Vancouver provides a template for municipal reporting, in order to maintain a consistent approach to ILWRMP reporting across Metro Vancouver member municipalities. Metro Vancouver plans to bring forward the ILWRMP Biennial Report to the June 12, 2015 GVS&DD Board Meeting, and submit the report to the Minister of Environment in July.

This staff report reviews the City’s progress on the ILWRMP municipal actions and presents the 2015 Liquid Waste Management Plan Biennial Report (2015 Biennial Report) (Attachment 1) to Council for information and consideration.

Analysis

The ILWRMP includes a municipal commitment to report progress on a biennial basis. The 2015 Biennial Report covers the 2013 to 2014 reporting period. Richmond has previously submitted five biennial reports over the last 12 years based on reporting requirements in previous Liquid Waste Management Plans.

The 2015 Biennial Report includes 27 narratives, several tables and graphics attachments that report on the 27 municipal commitments included in the ILWRMP. The City is meeting or exceeding all of the requirements of the ILWRMP. The following are highlights of Richmond’s 2015 Biennial Report:

Inflow and Infiltration (I&I)

ILWRMP action 1.1.18 requires municipalities to develop and implement I&I management plans that ensure I&I levels are within Metro Vancouver allowances, as measured at Metro Vancouver’s flow metering stations. The City’s I&I rate is 10,100 L/ha/d, as measured at the Lulu Island Wastewater Treatment Plant. This level of I&I is 10% below the Metro Vancouver allowance of 11,200 L/ha/d. Staff continue to monitor I&I levels at the City’s sanitary pump stations, identifying any catchments that may have higher I&I rates for subsequent study and remediation if required.

On-Site Rainwater Management

ILWRMP action 1.1.20 requires municipalities to update municipal bylaws to require on-site rainwater management sufficient to meet criteria established in municipal stormwater plans or baseline region-wide criteria by 2014. Richmond already incorporates a number of on-site rainwater management features in its bylaws and standards, including green roofs and boulevard swales. Richmond has also developed an Integrated Rainwater Resource Management Strategy (IRRMS), which provides recommendations for on-site rainwater management. A staff report is being prepared to present the IRRMS to Council.

Condition Assessment

ILWRMP action 3.1.6 requires inspection and condition assessment of the municipal sanitary sewer system on a 20-year cycle. Richmond has inspected and assessed 90% of its sanitary sewers over the last 14 years and is ahead of schedule on this action. The remaining 10% is expected to be completed this year, 6 years ahead of schedule.

Asset Management Plan

ILWRMP action 3.1.8 requires municipalities to develop and implement asset management plans and to provide copies of those plans to Metro Vancouver by 2014. Richmond has both an Ageing Infrastructure Management Plan and a Growth Related Infrastructure Management Plan. Both of these have been in place for a number of years and were submitted ahead of Metro Vancouver's target date.

Sanitary Sewer Overflows

ILWRMP action 3.3.7 requires municipalities to report on the frequency and location of sewerage overflows from municipal sanitary sewers. The City does not have chronic sanitary sewer overflow issues and there were zero overflows for the reporting period. This is largely due to Richmond's successful capital and maintenance programs, separated sewer systems and low I&I rates.

Stormwater Management Plan

ILWRMP action 3.4.7 (related to action 1.1.20) requires municipalities to develop and implement stormwater management plans that integrate with land use by 2014. Richmond has developed an IRRMS ahead of Metro Vancouver's schedule.

Water Metering

Ministerial Condition 2 for approval of the ILWRMP strongly encourages municipalities to business case and/or implement residential water metering programs and to consider municipal rebate programs for water efficient fixtures and appliances to reduce water use.

The City has comprehensive water meter programs for both residential and commercial properties. All industrial, commercial, and farm properties in Richmond are metered. The City is universally metering all single-family properties, with a target completion in 2018, and multi-

family complexes can volunteer for water meters through a subsidized program. As of January 1, 77% of single-family properties and 35% of multi-family properties are metered.

To further promote reduced water use, the City provides metered customers with water conservation kits, which include low flow showerheads, faucet aerators, toilet fill cycle diverters, toilet leak detection tablets, and educational water conservation tools. In addition, the City has successful programs for toilet rebates, rain barrels, and clothes washer rebates. As of January 1, 4,848 toilet rebates, 966 rain barrels, and 205 clothes washer rebates have been issued to Richmond residents.

Financial Impact

None.

Conclusion

The 2010 ILWRMP includes a municipal commitment to report progress on ILWRMP actions on a biennial basis. The attached 2015 Biennial Report summarizes Richmond's progress on municipal actions for the 2013 to 2014 reporting period. The City of Richmond is meeting or exceeding all of the requirements of the ILWRMP and staff will continue work on municipal actions identified in the ILWRMP.

For Lloyd Bie, P.Eng.
Manager, Engineering Planning
(4075)

Jason Ho, P.Eng.
Project Engineer
(1281)

LB:jh

Att. 1: City of Richmond 2015 Liquid Waste Management Plan Biennial Report

2015 Liquid Waste Management Plan Biennial Report

Reporting Period: 2013 – 2014

Municipal Submission Section

To be completed by: March 1, 2015

| Municipal Contact Information | | | |
|-------------------------------|--|--------------|----------------------------------|
| Name | Email | Phone | Responsible For ILWMP Action #'s |
| Jason Ho, P.Eng. | jho@richmond.ca | 604-244-1281 | |
| Lloyd Bie, P.Eng. | lbie@richmond.ca | 604-276-4075 | |
| Lesley Douglas, R.P.Bio. | ldouglas@richmond.ca | 604-247-4672 | 1.1.16 |
| Alen Postolka, P.Eng. | apostolka@richmond.ca | 604-276-4283 | 1.3.17, 3.3.6 |

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2. Municipal Reporting Submission1

Submission Checklist

Narratives:

- ☒ Narrative 1: *Summarize ongoing permitting & inspection programs*
- ☒ Narrative 2: *Summarize approach to regulating pesticides and lawn care products*
- ☒ Narrative 3: *Summarize updates to outreach plans for supporting liquid waste source control programs (e.g. stormwater, sewer use, sewer maintenance, I&I management, cross connections etc.) during the reporting period*
- ☒ Narrative 4: *Summarize I&I management plans & list key actions resulting from plans*
- ☒ Narrative 5: *Summarize enforcement enhancements and process efforts during reporting period*
- ☒ Narrative 6: *Highlight and summarize bylaw changes relating to stormwater management*
- ☒ Narrative 7: *Highlight and summarize changes to utility design standards and neighbourhood design guidelines in relation to on-site rainwater management*
- ☒ Narrative 8: *Summarize development of municipal sanitary overflow management plans. Highlight specific examples.*
- ☒ Narrative 9: *Highlight & summarize progress on the prevention of CSOs and the separation of combined sewers*
- ☒ Narrative 10: *List approaches and strategies that address risks (ie: regular maintenance, SCADA, monitoring, protocols, identified redundancies/contingencies)*
- ☒ Narrative 10A: *Identify any emergency procedures & protocols developed for 2013-2014.*
- ☒ Narrative 11: *Describe regulations and status of applications*
- ☒ Narrative 12: *Summarize existing municipal odour control programs and the implementation of new programs for targeted municipal sewer facilities*
- ☒ Narrative 13: *Summarize air emissions management programs for standby power generators at municipal sewer pump stations*

- ☒ Narrative 14: *Summarize greenhouse gas emissions reduction initiatives for municipal liquid waste services.*
- ☒ Narrative 15: *Summarize key progress on the assessment and condition of municipal sewerage system*
- ☒ Narrative 16: *Summarize key progress or accomplishments on the development of asset management plans for municipal sewerage infrastructure*
- ☒ Narrative 17: *Summarize key findings from the tri-annual internal audit (first due in 2013)*
- ☒ Narrative 18: *Summarize the estimate of greenhouse gas emissions and odours associated with the operation of municipal and regional liquid waste management systems*
- ☒ Narrative 19: *Summarize and highlight any important details and action plans relating to wet weather SSOs & probable causes of CSOs*
- ☒ Narrative 20: *Summarize and highlight any changes to the existing municipal sewer flow & sewer level monitoring network*
- ☒ Narrative 21: *Summarize progress on the development of emergency management strategies and response plans for municipal & regional wastewater collection and treatment systems*
- ☒ Narrative 22: *Summarize key initiatives that support the adaptation of infrastructure & operations to address risks and long term needs*
- ☒ Narrative 23: *Summarize and highlight key initiatives relating to the development and implementation of the integrated management plans*
- ☒ Narrative 24: *Discuss water metering & rebate programs relating to water fixtures and appliances*
- ☒ Narrative 25: *Summarize whether any new municipal water metering policies or programs were introduced in 2013-2014 that address this action. If no changes, then indicate, "Same as the 2010-2012 reporting period: no changes".*
- ☒ Narrative 26: *Quote relevant OCP sections addressing stormwater, stream health and their consideration of ISMPs*

Tables:

- ☒ Table 1: *List core sewer use bylaws and summarize any changes*
- ☒ Table 2: *Summarize Status of Bylaws Related to Controlling Sediment Transport & Erosion*
- ☒ Table 3: *Types and Number of Liquid Waste Related Permits Issued 2013-2014*
- ☒ Table 4: *Products Regulated to Protect Stormwater Runoff Quality*
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- ☒ Table 6: *List standards and guidelines and where applied*
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- ☒ Table 8: *Bylaws and Regulations Requiring Pleasure Craft Pump-out Facilities at Marinas*
- ☒ Table 9: *Summary of LWMP Implementation Budgets and Forecasts*
- ☒ Table 10: *Summary of Municipal Progress 2013-2014*

Graphics & GIS Data:

☒ Attachment 1:

- I&I Mapping showing I&I rates for neighbourhoods where studies have been completed with before and after I&I (L/ha-d). Objectives to Illustrates catchment areas covered by I&I studies.
- Transmit an electronic copy of GIS shape files for study catchment boundaries to Metro Vancouver

☒ Attachment 2:

- Mapping showing where sewer separation work occurred in 2013-2014
- GIS shape files of the locations where sewer separation occurred in 2013-2014 for composite mapping
- GIS shape files of catchments of remaining combined sewer catchments as of December 31, 2014 (if separated catchments discharge to combined sewers, code the separated catchments as "separated").

☒ Attachment 3:

- Map and GIS data showing location of emergency municipal overflows (this information should have already been provided through a separate request through the REAC LWSC as well as the 2010-2012 reporting). If already provided, please indicate so.

☒ Attachment 4:

- 2013-2014 map showing odour control facilities & locations of complaints (different than facility)
- GIS shape files for the odour facility and complaint mapping to allow for development of composite mapping

☒ Attachment 5:

- A map showing sewerage system CCTV inspection for 2013-2014 and the other areas of CCTV inspection work in a different colour over the previous 18 years (1994-2012).
- A map showing any sewer replacement /rehabilitation work for 2013-2014 as part of either asset management or capacity upgrades. Indicate whether the work is for upgrades or maintenance.

☒ Attachment 6:

- Titles of any completed asset [replacement] management plans (author, date, title, and publisher) for 2013-2014.
- Completed annual PSAP 3150 reporting on asset values for 2013-2014.
- Colour coded map showing age of the sewerage system (i.e.: <1900, 1901-1925, 1926-1950, 1951-1975, 1976-2000, >2001) updated to show any changes made in 2013-2014. If no changes, please indicate so and the mapping prepared for the 2010-2013 reporting period will be used.

☒ Attachment 7:

- Provide (if not already provided) GIS shape files which have the locations of the CSO outfalls for purposes of summary mapping (should already be reported under WSER).
- Provide GIS shape files or coordinates for the locations of wet & dry weather SSOs for each year (indicate which is dry/wet and year). Include SSO dates and estimated volume

☒ Attachment 8:

- Map and GIS coordinates showing locations of active municipal sewer flow/level monitors for the reporting period 2013-2014 (indicate whether permanent or temporary)

☒ Attachment 9:

- If not already provided, provide updated GIS shape files of the municipal sanitary sewer network, including manholes, pump stations, pipe diameters for the municipal sewer system as of the end of 2014. Please indicate what changes have been made for 2013-2014.

☒ Attachment 10:

- GIS shape files showing the ISMP boundaries and their status: Development Phase= Yellow; Implementation Phase = Light Green; Completed Phase = Dark Green. Add ISMPs still to start development as outlined only).

☒ Attachment 11:

- If initiated, results per watershed (as per ISMP Adaptive Management Framework)
- If undertaken, a map plus GIS shape files/coordinates showing location of monitoring.

☒ Attachment 12:

- Map showing any 2013-2014 changes to protected riparian areas & possible stream classifications. If no changes, then this figure is not required.

City of Richmond

Action 1.1.14 – Review and enhance sewer use bylaws to reduce liquid waste at source, including contaminants identified by the *Canadian Environmental Protection Act (2012)*.

Table 1 Core Sewer Use Bylaws

| Sewer Use Bylaws* | 2013-2014 Changes** |
|---|--|
| Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551 | No changes with respect to reducing liquid waste at source |
| Public Health Protection Bylaw No. 6989 | No changes |
| Pollution Prevention and Clean-Up Bylaw No. 8475 | No changes |

*Re-list existing core sewer use bylaws and list all new bylaws

**Summarize any changes (if no changes, enter "No changes")

Table 2 Summarize Status of Bylaws Related to Controlling Sediment Transport & Erosion

| Name of Bylaw* | |
|---|--------------------|
| (related to controlling sediment release from land clearing and construction phase of development) | |
| Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551 | |
| Pollution Prevention and Clean-Up Bylaw No. 8475 | |
| Boulevard and Roadway Protection and Regulation Bylaw No. 6366 | |
| Boulevard Maintenance Bylaw No. 7174 | |
| City of Richmond Engineering Design Specifications | |
| Bylaw Details | 2013-2014 Changes* |
| Summarize monitoring requirements | No changes |
| How data is assessed under the bylaw? | No changes |
| How is assessment used to initiate corrective actions? | No changes |
| Summarize approaches used to maintain compliance with the bylaw (e.g. annual resources dedicated to maintaining compliance). | No changes |
| Discuss effectiveness of bylaw/bylaws and current approach to prevent inputs of sediment to the storm system and receiving environment. | No changes |

*For bylaws unchanged since 2010-2012, summarize any changes 2013-2014 (if no changes, enter "No changes"). Otherwise, describe the new bylaw.

Action 1.1.15* – Continue existing programs of permitting and inspection to support and enforce sewer use bylaws (Ongoing, **City of Vancouver Only*).

Narrative 1: Summarize ongoing permitting & inspection programs

N/A

Table 3 Types and Number of Liquid Waste Related Permits Issued 2013-2014

| Permit Type/Name* | Number of Permits* | Referenced Bylaw* |
|-------------------|--------------------|-------------------|
| N/A | | |
| | | |
| | | |

**City of Vancouver Only*

Action 1.1.16 – Identify and regulate pesticides and lawn care products which negatively affect rainwater runoff quality and urban stream health (2014).

Narrative 2: Summarize approach to regulating pesticides & lawn care products for 2013-2014.

Richmond's Enhanced Pesticide Management Program (EPMP) reduces the exposure of Richmond residents to unnecessary pesticide use. This program includes a regulation restricting the use of pesticides for cosmetic purpose, as well as resources to empower community members to make the switch to pesticide-free practices.

Pesticide Use Control Bylaw No. 8514 restricts the cosmetic use of pesticides on residential and municipally-owned lands, allowing only low-toxicity products listed under the BC Integrated Pest Management (IPM) Regulation Schedule 2: Excluded Pesticides. In addition to bylaw enforcement, the City provides an expanded Education and Community Partnerships Program to inform the community about pesticide restrictions and to promote natural gardening and pest solutions. This includes a series of natural gardening workshops and a phone line to help residents learn proper plant care and sustainable pest solutions.

Table 4 Products Regulated to Protect Stormwater Runoff Quality

| Regulated Products | Type of Regulation (Sales Ban, Use Ban, Permit, Limited Users, etc.) | Additional Information (Referenced Bylaw & Policy Numbers) |
|--------------------|--|--|
| Pesticide | Limited users | Pesticide Use Control Bylaw No. 8514 |
| | | |
| | | |

Action 1.1.17 – Continue outreach plans to support liquid waste source control programs (*Ongoing*).

Narrative 3: Summarize 2013-2014 updates to outreach plans for supporting liquid waste source control programs (e.g. stormwater, sewer use, sewer maintenance, I&I management, cross connections etc.).

Green Cart Program

The Green Cart Program, an extension of the Green Can Program, started in 2013, with added service for townhouses.

Through the Green Cart Program, over 30,000 tonnes of food scraps and yard trimmings were collected in 2013 and 2014 from curb side collection alone. This program reduces the amount of waste that would otherwise be discharged to the sanitary sewer through garburators. To facilitate grease reduction in the sanitary system, Richmond conducts the following activities:

- Provide Green Cart Program literature, which includes information on the impact of grease on the sewer system as well as proper grease disposal techniques.
- Accept cooking oil and animal fat at the City's Recycling Depot.
- Promote proper disposal of cooking oil and grease on Facebook, annual collection calendar, ads in local newspaper, and annual report.
- Discourage the use of garburators as part of the Green Cart Program.
- Carry out the Green Cart and Recycling Depot programs, which allow residents to recycle food scraps and solid grease.

Metro Vancouver Waste Water Discharge Permit Process

The City continues to participate in the Metro Vancouver sanitary sewer source control program by supporting the Metro Vancouver Waste Water Discharge Permit process.

Fat, Oil and Grease Reduction Programs

Richmond Community Bylaws staff continued to work with representatives from Metro Vancouver, stakeholder groups, industry associations, pumping operators and grease trap vendors to mitigate the impact of fats, oils and grease (FOG) on the region's sanitary sewer system.

In addition, the City carried out the Grease Management Program, which included active inspection and enforcement of food sector establishments. In 2013 and 2014, assertive enforcement efforts resulted in 174 tickets issued and \$26,250 in revenue.

Rainwater Best Management Practices

Richmond's Official Community Plan Bylaw No. 9000 – Schedule 1, Section 14.2.10, Development Permit Guidelines – Green Buildings and Sustainable Infrastructure, provides general direction in regards to the voluntary undertaking, where feasible, of green building and sustainable infrastructure to support City

of Richmond sustainability objectives and help reduce the demand for energy and resources. Developers are encouraged to incorporate green roofs, bio-swales, infiltration and other best management practices throughout the building site to store rainwater, mitigate urban heat island effect, reduce heating and cooling loads and reduce the impact on City drainage systems.

Rain Barrel Program

The City offers rain barrels to Richmond residents at subsidized prices.

Low-Flow Toilet Rebate Program

The City offers a \$100 rebate to residents for replacing old toilets with new low-flush toilets to reduce waste volume through water conservation.

High-Efficiency Clothes Washer Rebate Program

The City partnered with BC Hydro to offer a maximum \$200 rebate to residents for replacing old clothes washers with new energy- and water- efficient models, in order to reduce GHGs through energy conservation as well as waste volume through water conservation.

Water Meter Programs

The City meters all commercial and industrial properties. Single-family dwellings will be universally metered by 2018, and multi-family complexes are eligible to volunteer for meters. Water metering encourages water conservation which, in turn, reduces waste volume.

Action 1.1.18 – Develop and implement inflow and infiltration management plans, using the Metro Vancouver template as a guide, to ensure wet weather inflow and infiltration volumes are within Metro Vancouver’s allowances as measured at Metro Vancouver’s flow metering stations (2012).

Narrative 4: Summarize I&I management plans & list key actions resulting from plans in 2013-2014. If no work was initiated or undertaken for 2013-2014, then indicate “Same as the 2010-2012 reporting period: no changes”.

Richmond’s overall I&I rate for a five-year return period storm is 10,100 L/ha/d, based on flows recorded at the Lulu Island Wastewater Treatment Plant. This rate is of I&I is 10% below the regional allocation of 11,200L/ha/d.

Richmond monitors I&I at the catchment level through pump runtimes at sanitary pump stations. Detailed pump runtimes are captured in data loggers that are manually downloaded to spreadsheets and subsequently converted to sanitary flow rates. The results of this monitoring program are included graphically in Attachment 1.

Richmond has installed pressure sensors at sanitary pump stations in order to improve the accuracy of pump runtime analysis. Utilizing pressure information and pump curves will improve the accuracy of the flow information generated by the City's monitoring program. In addition, the City continues to install magnetic flow meters at new sanitary pump stations. Automated pump runtime data collection has also been set up through the SCADA network, and the City is moving towards utilizing FlowWorks to further analyze the data collected.

Catchment level data is being utilized to identify catchments with excessive I&I for further study. This study will include a review of sanitary system response to rainfall events in order to determine the relative levels of I&I. This information will be subsequently utilized to identify appropriate inspection techniques for further catchment review.

Richmond has completed the CCTV inspection and sanitary sewer condition assessment for 90% of its gravity sewer system. The sewers inspected to date were found to be in excellent condition. There are very few significant structural defects (0.2 structural defects per km of pipe inspected), as well as low rates of I&I defects, which mainly consisted of infiltration at joints (0.7 I&I defects per km of pipe inspected).

Attachment 1:

a) I&I Mapping showing I&I rates for neighbourhoods where studies have been completed with before and after I&I (L/ha-d). Objectives to Illustrates catchment areas covered by I&I studies.

b) Transmit an electronic copy of GIS shape files for study catchment boundaries to Metro Vancouver.

Action 1.1.19 – Enhance enforcement of sewer use bylaw prohibition against the unauthorized discharge of rainwater and groundwater to sanitary sewers (2010).

Narrative 5: Summarize enforcement enhancements and process effort changes during 2013-2014. If no changes, then enter "Same as the 2010-2012 reporting period: no changes".

Same as the 2010-2012 reporting period: no changes.

Table 5 Bylaws Regulating Discharges of Groundwater and Rainwater to Sanitary Sewers

| Regulation or Bylaw No. | Date | Summary of Any Changes 2013-2014* |
|---|----------------------------------|---|
| Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551 | Effective Date – January 1, 2003 | No changes with respect to unauthorized discharge of rainwater and groundwater to sanitary sewers |
| | | |

| | | |
|--|--|--|
| | | |
|--|--|--|

**if no changes, enter "no changes" in table.*

Action 1.1.20 – Update municipal bylaws to require on-site rainwater management sufficient to meet criteria established in municipal integrated stormwater plans or baseline region-wide criteria (2014).

Narrative 6: Highlight and summarize any bylaw changes or development effort relating to stormwater management for 2013-2014. If no changes, indicate "Same as the 2010-2012 reporting period: no changes".

In addition to the bylaws and development effort outlined for the 2010-2012 reporting period, the City has developed an Integrated Stormwater Management Plan (ISMP), which establishes on-site rainwater management criteria.

Table 6 Bylaws Related to On-site Stormwater Management

| Related Stormwater Bylaws | Changes to On-Site Stormwater Management Target/Objectives (2013-2014)* |
|--|--|
| Green Roofs & Other Options Involving Industrial & Office Buildings Outside the City Centre Bylaw No. 8385 | No changes |
| Official Community Plan Bylaw No. 9000 | No changes |
| Pollution Prevention and Clean-Up Bylaw No. 8475 | No changes |

**if no changes, enter "no changes" in table.*

Action 1.1.21 – Update municipal utility design standards and neighbourhood design guidelines to enable and encourage on-site rainwater management (2014).

Narrative 7: Highlight and summarize changes for 2013-2014 to utility design standards and neighbourhood design guidelines in relation to on-site rainwater management. If no changes were made or processes initiated, then indicate "Same as the 2010-2012 reporting period: no changes".

Same as the 2010-2012 reporting period: no changes.

Table 7 Municipal Standards, Guidelines and Policy Changes Related to On-site Stormwater Management

| Name of Standard, Guideline or Policy | Changes for 2013-2014 |
|--|------------------------------|
| City of Richmond Engineering Design Specifications | No changes |

| | |
|--|--|
| | |
| | |

**If identified unchanged since 2010-2012, briefly summarize any changes 2013-2014 (if no changes, enter "No changes"). Otherwise, briefly summarize if a new bylaw.*

Action 1.2.5 – Work with Metro Vancouver to develop and implement municipal-regional sanitary overflow management plans as set out in 1.2.4 (2013).

Narrative 8: Summarize development of any municipal sanitary overflow management plans for 2013-2014. Highlight any specific examples. If no new plans developed, then indicate "Same as the 2010-2012 reporting period: no changes".

Same as the 2010-2012 reporting period: no changes.

Action 1.2.6 – Burnaby, New Westminster and Vancouver will work with Metro Vancouver to give effect to 1.2.2 and, specifically, implement plans to prevent combined sewer overflows by 2050 for the Vancouver Sewerage Area and 2075 for the Fraser Sewerage Area and separate combined sewers at an average rate of 1% and 1.5% of the system per year in the Vancouver Sewerage Area and Fraser Sewerage Area respectively (Ongoing).

Narrative 9: Highlight and summarize progress on the prevention of CSOs and the separation of combined sewers for 2013-2014.

There are no combined sewers in Richmond.

Attachment 2:

- a) Mapping showing where sewer separation work occurred in 2013-2014
- b) GIS shape files of the locations where sewer separation occurred in 2013-2014 for composite mapping
- c) GIS shape files of catchments of remaining combined sewer catchments as of December 31, 2014 (if separated catchments discharge to combined sewers, code the separated catchments as "separated").

N/A

Action 1.3.11 – Develop and implement operational plans for municipal sewerage facilities to ensure infrastructure reliability and optimal performance (*Ongoing*).

Narrative 10: Discuss approaches and strategies applied in 2013-2014 that address risks (i.e. regular maintenance, SCADA, monitoring, protocols, identified redundancies/contingencies). If these are the same as the previous reporting period 2010-2012, then indicate “Same as the 2010-2012 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2010-2012 reporting period except for...”

In addition to the approaches and strategies outlined for the 2010-2012 reporting period, the City has installed pressure sensors at its 152 sanitary pump stations to provide additional pump and forcemain performance information. Several upgrades to the SCADA infrastructure were completed in 2014, including decentralization of primary and secondary repeaters, fibre optic network upgrades, redundancy equipment upgrades, and backup power upgrades.

Action 1.3.12 – Work with Metro Vancouver to develop and implement emergency sanitary sewer overflow plans including contingency plans to minimize impacts of unavoidable sanitary sewer overflows resulting from extreme weather, system failures or unusual events (*Ongoing*).

Narrative 10A: Identify any emergency procedures & protocols developed for 2013-2014. If these are the same as the previous reporting period 2010-2012, then indicate “Same as the 2010-2012 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2010-2012 reporting period except for...”

Richmond’s municipal sanitary system did not experience any sanitary sewer overflows during the reporting period. Richmond does not have any combined sewer systems, and maintains an overall I&I rate below the regional design allowance. As such, Richmond does not have chronic sanitary sewer overflow issues due to weather or rainfall. There have been no changes to the emergency management plan, procedures, and protocols outlined for the 2010-2012 reporting period.

Attachment 3:

Map and GIS data showing location of emergency municipal overflows (this information should have already been provided through a separate request through the REAC LWSC as well as the 2010-2012 reporting). If already provided, please indicate so.

N/A

Action 1.3.13 – Work with private marina operators, Ministry of Environment and Environment Canada to develop and implement regulations to ensure all new marinas and marinas where planned renovations exceed 50% of the assessed existing improvements value have pleasure craft pump-out facilities (*Ongoing*).

Table 8 Bylaws and Regulations Requiring Pleasure Craft Pump-out Facilities at Marinas

| Regulation Process or Bylaw* | Date* |
|---|------------------------------------|
| Public Health Protection Bylaw No. 6989, Subdivision Two – Marina Health and Safety Regulation | Effective Date – March 13, 2000 |
| | |
| | |

* This may be repeated from the 2010-2012 reporting period

Action 1.3.14 – Require all pleasure craft pump-out facilities to connect to a municipal sanitary sewerage system or a provincially permitted on-site treatment and disposal system or have established enforceable protocols for transporting liquid waste for disposal at a permitted liquid waste management facility (*Ongoing*).

Narrative 11: Describe any additional regulations and the number of on-site treatment systems required/installed during the reporting period 2013-2014. If these are the same as the previous reporting period 2010-2012, then indicate "Same as the 2010-2012 reporting period: no changes".

Same as the 2010-2012 reporting period: no changes.

Action 1.3.15 – Continue existing municipal odour control programs and implement new programs for targeted municipal sewer facilities (*Ongoing, see Action 3.3.4*).

Narrative 12: Summarize existing municipal odour control programs and the implementation of new programs for targeted municipal sewer facilities for the reporting period 2013-2014. If these are the same as the previous reporting period 2010-2012, then indicate "Same as the 2010-2012 reporting period: no changes", or if only minor changes, enter appropriate text similar to "Same as the 2010-2012 reporting period except for..."

Same as the 2010-2012 reporting period: no changes.

Attachment 4:

- a) 2013-2014 map showing odour control facilities & locations of complaints (different than facility)

- b) *GIS shape files for the odour facility and complaint mapping to allow for development of composite mapping*

Action 1.3.16 – Develop and implement air emissions management programs for standby power generators at municipal sewer pump stations (2016).

Narrative 13: Summarize air emissions management programs for standby power generators at municipal sewer pump stations. If these are the same as the previous reporting period 2010-2012, then indicate “Same as the 2010-2012 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2010-2012 reporting period except for...” This action is not due until 2016.

Notes: Metro Vancouver has developed “Specifications for New Diesel Powered Vehicles & Equipment” as part of its green procurement process (details were shared with the REAC-LWS at an earlier meeting and are available from MV).

Same as the 2010-2012 reporting period: no changes.

Action 1.3.17 – Develop and implement programs to reduce greenhouse gas emissions from municipal liquid waste management systems to help achieve federal, provincial and municipal greenhouse gas targets (Ongoing, see Action 3.1.5).

Narrative 14: Summarize greenhouse gas emissions reduction initiatives for municipal liquid waste services. If these are the same as the previous reporting period 2010-2012, then indicate “Same as the 2010-2012 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2010-2012 reporting period except for...”

Richmond’s 2041 OCP includes targets to reduce the community’s energy use by 10 per cent by 2020, and to reduce community greenhouse gas (GHG) emissions by 33 per cent by 2020 and 80 per cent by 2050. In January 2014, City Council approved Richmond’s Community Energy and Emissions Plan (CEEP). The CEEP includes:

- Strategy 9: Continue Advancement of Neighbourhood District Energy Systems;
- Strategy 10: Utilize Local Energy Sources; and
- Strategy 11: Maximize Use of Waste, including liquid waste.

In 2013, Richmond completed installation of the Gateway Theatre Sewer Heat Recovery System to recover heat from a municipal wastewater pump station. The system reduces the amount of natural gas and associated GHG emissions required to heat the Gateway Theatre. It is estimated that this project will reduce GHG emissions at the facility by 50 tonnes CO₂e. This was a pilot project implemented to validate the concept of sewer heat recovery and to support similar projects in the future.

Richmond is working with Metro Vancouver to implement a sewer heat recovery system on the Gilbert Trunk Sewer as part of the River Green District Energy Utility. During the reporting period, Lulu Island Energy Company Inc. (LIEC), a City-owned corporation that manages district energy initiatives, executed a Concession Agreement with Corix Utilities Inc. to provide thermal energy services to developments proximate Richmond's Oval Village. The project is under construction with first customers expected to be connected to the system in spring 2015. The sewer heat recovery portion of the project has a target construction date in 2018. At full build-out, there will be an estimated 2600 tonnes CO₂e GHG emissions reduction.

To reduce corporate GHG emissions, Richmond is partnering with Metro Vancouver to explore sewer heat recovery options at Lulu Island Waste Water Treatment Plant (LIWWTP), and is supporting the Metro Vancouver and FortisBC Biomethane Pilot Program at LIWWTP by purchasing renewable natural gas (RNG). The first phase of the project has reduced corporate GHG emissions by 186 tonnes CO₂e. Development of the biomethane plant at LIWWTP will potentially allow for the City to purchase more RNG and further reduce its corporate GHG emissions by approximately 2,000 tonnes of CO₂e.

Richmond secures commitments from new developments in the City Centre Area to be "District Energy Ready" as part of rezoning and development permitting. This is part of a medium- to long-term strategy to develop district energy utilities in the City Centre.

Action 3.1.6 – Assess the performance and condition of municipal sewerage systems by: (a) inspecting municipal sanitary sewers on a twenty year cycle, (b) maintaining current maps of sewerage inspection, condition and repairs, and (c) using the Metro Vancouver "Sewer Condition Report, November 2002" as a guide to ensure a consistent approach to sewer system evaluation and reporting (*Ongoing*).

Narrative 15: *Summarize key progress on the assessment and condition of municipal sewerage system for 2013-2014. If these are no changes since the previous reporting period 2010-2012, then indicate "Same as the 2010-2012 reporting period: no changes".*

In addition to the condition assessments outlined for the 2010-2012 reporting period, Richmond issued a request for proposals (RFP) for the CCTV inspection and assessment of the remaining 10% of its gravity sanitary sewer system. This project will be undertaken in 2015.

Attachment 5:

- a) *A map showing sewerage system CCTV inspection for 2013-2014 and the other areas of CCTV inspection work in a different colour over the previous 18 years (1994-2012).*
- b) *A map showing any sewer replacement /rehabilitation work for 2013-2014 as part of either asset management or capacity upgrades. Indicate whether the work is for upgrades or maintenance.*

Action 3.1.8 – Develop and implement asset management plans targeting a 100 year replacement of rehabilitation cycle for municipal sewerage infrastructure and provide copies of such plans to Metro Vancouver (2014).

Narrative 16: Summarize key progress or accomplishments on the development of asset management plans for municipal sewerage infrastructure for 2013-2014.

Richmond has an ongoing Ageing Infrastructure Replacement Program with dedicated funding from the Sanitary Sewer Utility that maintains the sanitary system in an appropriate operating condition. Staff report to City Council annually on the status of the program, including current infrastructure status, long-term funding requirements and funding gaps if they exist. The 2013 program update identified a long-term, sustainable capital requirement of \$6.4M and a budget of \$4.3M. City Council and staff have made significant progress in closing the funding gap and will continue to close the gap in subsequent utility rate setting cycles. The sanitary system is relatively young and the bulk of replacement funding is predicted to be required between 2041 and 2061. As such, the incremental approach to closing the funding gap is appropriate for the City of Richmond.

Attachment 6:

- a) *Titles of any completed asset [replacement] management plans (author, date, title, and publisher) for 2013-2014.*

Ageing Infrastructure Planning 2013 Update (August 14, 2013, Lloyd Bie, P.Eng., Andy Bell, P.Eng.), REDMS 3878967

Engineering Design and Construction – Construction Program Update to Mayor and Council, (Eric Sparolin, P.Eng.), REDMS 3249431

5-Year Capital Program – Sanitary, (Jason Ho, P.Eng.), REDMS 3247757

- b) *Completed annual PSAP 3150 reporting on asset values for 2013-2014.*

2013 Annual Report: <http://www.richmond.ca/cityhall/finance/reporting/reports.htm>

More information on Richmond's non-financial assets is available at:

http://www.cscd.gov.bc.ca/lgd/infra/municipal_stats/municipal_stats2013.htm

- c) *Colour coded map showing age of the sewerage system (i.e.: <1900, 1901-1925, 1926-1950, 1951-1975, 1976-2000, >2001) updated to show any changes made in 2013-2014. If no changes, please indicate so and the mapping prepared for the 2010-2013 reporting period will be used.*

Action 3.2.4 – Undertake a tri-annual internal audit of best practices of one municipal liquid waste management sub-program in each municipality to identify opportunities for innovation and improvements (*Triennially*).

Narrative 17: Summarize key findings from the tri-annual internal audit (first due for 2013, the next in 2016).

Ageing Infrastructure Planning Program

In 2013, Richmond conducted a review of the Ageing Infrastructure Planning Program, which included reconciling current inventory, reviewing the evolving theory on infrastructure service life, and updating infrastructure replacement pricing.

This audit identified the following key findings:

- Infrastructure replacement costs continue to increase due to inflation, environmental requirements and sanitary pump station complexity.
- Sanitary pump stations are becoming larger and more complex as the demands on them increase. Additionally, building pump stations in a built-out urban environment creates significant challenges beyond those encountered during green field development, including working in close proximity to existing structures and infrastructure, as well as accommodating existing flows during the construction period. As such, cost estimates for replacing Richmond's 152 sanitary pump stations have increased, thereby having a corresponding impact on the long-term annual funding requirement.
- Development facilitates significant infrastructure replacement, having a positive impact on the City's overall ageing infrastructure picture. However, development is subject to external factors, such as the economy, and does not always coincide with infrastructure that is beyond its useful life. Therefore, development is not considered a sustainable resource for ageing infrastructure replacement.
- The long-term, sustainable capital requirement is \$6.4M for the sanitary utility. The current budget is \$4.3M. Closing the funding gap is achievable within the next decade or sooner through the annual budgeting process.

Action 3.3.6 – In collaboration with Metro Vancouver, estimate and document the greenhouse gas emissions and odours associated with the operation of the municipal and regional liquid waste management systems (*2014*).

Narrative 18: Summarize the estimate of greenhouse gas emissions associated with the operation of municipal and regional liquid waste management systems. Odour control and mapping are being reported under Action 1.3.15.

The estimated total emissions in 2013 due to electricity use at sanitary pump stations and sanitary fleet fuel use for operational tasks is 95.2 tonnes of tCO₂e.

Action 3.3.7 – Estimate and report on the frequency, location and volume of sewerage overflows from municipal combined and sanitary sewers, and where feasible identify and address the probable causes (*Ongoing*).

Narrative 19: Summarize and highlight any important details and/or action plans relating to managing wet weather SSOs, CSOs and dry & wet weather SSOs during the period 2013-2014. If no changes since 2010-2012, then indicate "Same as the 2010-2012 reporting period: no changes".

For each CSO location, in a table indicated estimated volumes & number of occurrences (this will have been prepared for EC WSER reporting but is also required by the LWMP).

Richmond did not have any dry or wet weather SSOs during 2013 and 2014. There are no combined sewers in Richmond.

Attachment 7:

- a) Provide (if not already provided) GIS shape files which have the locations of the CSO outfalls for purposes of summary mapping (should already be reported under WSER).

N/A

- b) Provide GIS shape files or coordinates for the locations of wet & dry weather SSOs for each year (indicate which is dry/wet and year). Include SSO dates and estimated volume.

N/A

Action 3.3.8 – Maintain and, if necessary, expand the existing municipal sewer flow and sewer level monitoring network (*Ongoing*).

Narrative 20: Summarize and highlight any changes to the existing municipal sewer flow & sewer level monitoring network for 2013-2014 (if no changes, then indicate "Same as the 2010-2012 reporting period: no changes").

In addition to the sewer flow and level monitoring outlined for the 2010-2012 reporting period, the City has set up automated pump runtime data collection through the SCADA network.

Attachment 8:

- a) Map and GIS coordinates showing locations of active municipal sewer flow/level monitors for the reporting period 2013-2014 (indicate whether permanent or temporary)

Action 3.4.4 – In collaboration with Metro Vancouver and the Integrated Partnership for Regional Emergency Management (IPREM), develop emergency management strategies and response plans for municipal and regional wastewater collection and treatment systems (2015).

Narrative 21: Summarize any progress on the development of emergency management strategies and response plans for municipal & regional wastewater collection and treatment systems.

Note: This action is being addressed through direction by REAC to REAC LWSC and REAC WSC to undertake in 2015.

Same as the 2010-2012 reporting period: no changes.

Action 3.4.5 – Adapt infrastructure and operations to address risks and long-term needs (Ongoing).

Narrative 22: Summarize any key initiatives that support the adaptation of infrastructure & operations to address risks and long term needs (e.g. climate change, sea level rise, seismic risk, demographic growth, etc...). If no change from 2010-2012, then indicate, "Same as the 2010-2012 reporting period: no changes".

Same as the 2010-2012 reporting period: no changes.

Action 3.4.6 – Ensure liquid waste infrastructure and services are provided in accordance with the Regional Growth Strategy and coordinated with municipal Official Community Plans (Ongoing).

Attachment 9:

- a) *If not already provided, provide updated GIS shape files of the municipal sanitary sewer network, including manholes, pump stations, pipe diameters for the municipal sewer system as of the end of 2014. Please indicate what changes have been made for 2013-2014.*

NOTE: This information is part of the routine information provided to Metro Vancouver every two years in response to municipal obligations under the GVS&DD Act. This information will be used to update Metro Vancouver's GIS data base and to create a composite map showing alignment and discrepancies with the RGS.

Action 3.4.7 – Develop and implement integrated stormwater management plans at the watershed scale that integrate with land use to manage rainwater runoff (2014).

Narrative 23: Summarize and highlight key initiatives relating to the development and implementation of the integrated stormwater management plans for each watershed/ISMP area.

NOTE: Format and content should be similar to the reporting provided in January/February 2014 for the Interim Report: 2013 for the Integrated Liquid Waste and Resource Management Plan. See: <http://www.metrovancouver.org/services/liquid-waste/LiquidWastePublications/2014InterimReport-SSOsISMPs.pdf>

Richmond completed its ISMP, the Integrated Rainwater Resource Management Strategy (IRRMS), in advance of 2014. Due to Richmond's topography, diking, and historic agricultural land use, the City has few natural wetlands and no natural creeks or streams. However, many watercourses are recognized as Riparian Management Areas (RMAs), which are important wildlife habitats and contribute to surface water health. Richmond's drainage systems typically use enclosed, interlinked conduits and manmade watercourses to convey surface rainwater to gravity outfalls and drainage pump stations that discharge into the Fraser River. Due to the interlinked nature of the drainage systems, water can move in many directions throughout the system, making Lulu Island one big watershed. As such, the City completed one ISMP for the Lulu Island watershed.

Attachment 10:

- a) *GIS shape files showing the ISMP boundaries and their status: Development Phase= Yellow; Implementation Phase = Light Green; Completed Phase = Dark Green. Add ISMPs still to start development as outlined only).*

NOTE: The ISMPs will be summarized and mapped similar to the Interim Report 2013: <http://www.metrovancouver.org/about/publications/Publications/2014InterimReport-SSOsISMPs.pdf>

Action 3.5.8 – Biennially produce a progress report on plan implementation for distribution to the Ministry of the Environment that: (a) summarizes progress from the previous two years on plan implementation for all municipal actions, including the status of the performance measures, (b) includes summaries and budget estimates for proposed LWMP implementation programs for the subsequent two calendar years (July 1st biennially).

List budget estimates for the LWMP implementation programs and subsequent two years beyond biennial report (from 5 yr plan)

Table 9 Summary of LWMP Implementation Budgets and Forecasts

| LWMP Implementation Action | Details/Notes | Budget | | | |
|--|---|-------------------|-------------------|-------------------|-------------------|
| | | 2013 | 2014 | 2015* | 2016* |
| Sanitary Sewer Capital Program | Includes pump station replacement, gravity sewer and forcemain replacement, and sanitary rehabilitation works | 4.6M ¹ | 6.7M ¹ | 7.6M ¹ | 5.6M ¹ |
| Development Projects (Sub-Division Agreements) | | 3.8M | 1.8M | | |

* *Subject to council approval*

¹ Includes base budget of \$4.3M plus development cost charges, which is dependent on development as well as the location of capital projects.

Action 3.5.9 – This reporting is an annual requirement. In the year of the biennial report, this action is covered off by municipal reporting on 3.4.7 & 3.3.7. In other years this addressed through the Interim Report. This municipal reporting is summarized regionally by Metro Vancouver under its Action 3.5.6.

Note: The Interim Report: 2013 was submitted to the Ministry of Environment in February 2014.

Ministerial Condition 2 – Member municipalities are strongly encouraged to business case and/or implement residential water metering programs and to consider municipal rebate programs for water efficient fixtures and appliances to reduce potable water use.

Narrative 24: *Discuss initiatives that evaluate/support water metering and rebate programs to water fixtures and appliances*

Richmond has comprehensive water meter programs for both residential and commercial properties. All industrial, commercial, and farm properties in Richmond are metered. In 2014, Richmond started implementing universal water metering for all single-family properties, with a target completion in 2018. Multi-family complexes can volunteer for water meters, with the City providing a minimum subsidy of \$60,000 per complex. As of January 1, 2015, 77% of single-family properties and 35% of multi-family properties are metered in Richmond.

To complement these water meter programs, Richmond provides metered customers with free water conservation kits, which include low flow showerheads, faucet aerators, toilet fill cycle diverters, toilet leak detection tablets, and educational water conservation tools. In addition, Richmond offers a \$100 rebate to residents for replacing old toilets with new low-flush toilets, and subsidized rain barrels to collect and store water for outdoor use. Richmond also partnered with BC Hydro to offer a \$100/200

rebate for high-efficiency clothes washer replacements. As of January 1, 2015, 4,848 toilet rebates, 966 rain barrels, and 205 clothes washer rebates have been issued to Richmond residents.

Ministerial Condition 3 – Metro Vancouver, in partnership with member municipalities, is encouraged to pursue a region-wide water conservation program targeting the industrial, commercial, institutional and agricultural sectors as part of its new Drinking Water Management Plan. Remaining municipalities in the region that have not implemented metering for these sectors are encouraged to do so.

Narrative 25: Summarize whether any new municipal water metering policies or programs were introduced in 2013-2014 that address this action. If no changes, then indicate, "Same as the 2010-2012 reporting period: no changes".

Same as the 2010-2012 reporting period: no changes.

Ministerial Condition 7 – Member municipalities will, with MV planning and coordination, and to the satisfaction of the Regional Manager, develop a coordinated program to monitor stormwater and assess and report the implementation and effectiveness of Integrated Storm Water Management Plans (ISMPs). The program will use a weight-of-evidence performance measurement approach and will report out in the Biennial Report. The Regional Manager may extend the deadline for completion of ISMP by municipalities from 2014 to 2016 if satisfied that the assessment program could result in improvement of ISMP and protect stream health.

Narrative 26: Quote relevant OCP sections addressing stormwater, stream health and their consideration of ISMPs.

Given the ISMP deadline requirement, please indicate in as a list any ISMPs not developed by the end of 2014.

A draft Monitoring and Adaptive Management Framework (MAMF) for ISMPs was developed in August 2014, with input from the Stormwater Interagency Liaison Group (SILG) and Environmental Monitoring Committee. The MAMF classifies all watercourses in Richmond as lower gradient, and recommends monitoring of various parameters twice per year in lower gradient systems.

Attachment 11:

a) If initiated, results per watershed (as per ISMP Adaptive Management Framework)

Not available at this time

b) If undertaken, a map plus GIS shape files/coordinates showing location of monitoring

Not available at this time

Ministerial Condition 9 – The ILWRMP has a goal of protecting public health and the environment. In keeping with this goal and to ensure alignment with other national, provincial and regional initiatives, Metro Vancouver and member municipalities are encouraged to: (a) Have a local land use planning consider the direction provided by the ISMPs, (b) Consider how the degree, type and location of development within a drainage can affect the long-term health of the watershed, (c) Consider how to protect the stream, including the riparian areas that exert an influence on the stream, from long-term cumulative impacts and (d) Use scenarios and forecasting to systematically consider environmental consequences/benefits of different land use approaches prior to build-out (for example, Alternative Future type approaches).

Narrative 27: Please describe any changes to how you have used proactive planning processes as listed in Ministerial Condition 9 for 2013-2014 and provide examples. If there are no changes since 2010-2012, then indicate: "Same as the 2010-2012 reporting period: no changes".

Same as the 2010-2012 reporting period: no changes.

Attachment 12:

- a) *Map showing any 2013-2014 changes to protected riparian areas & possible stream classifications. If no changes, then this figure is not required.*

No changes.

Municipal Progress Summary Table

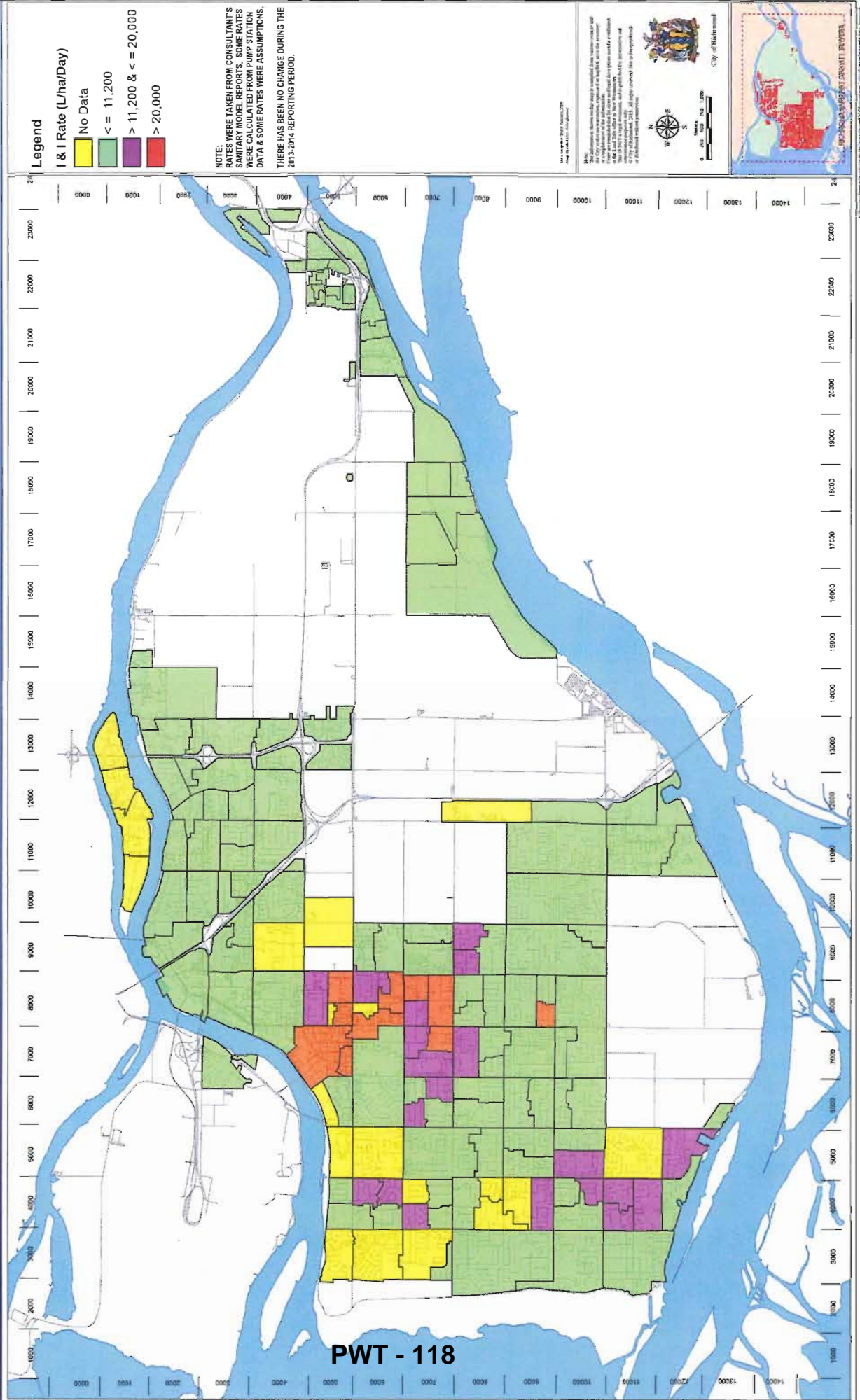
The summary table is the same format at pervious Biennial Report. The columns (Dec 2012 + Additions/Changes) should add to equal the Dec 2014 Total.

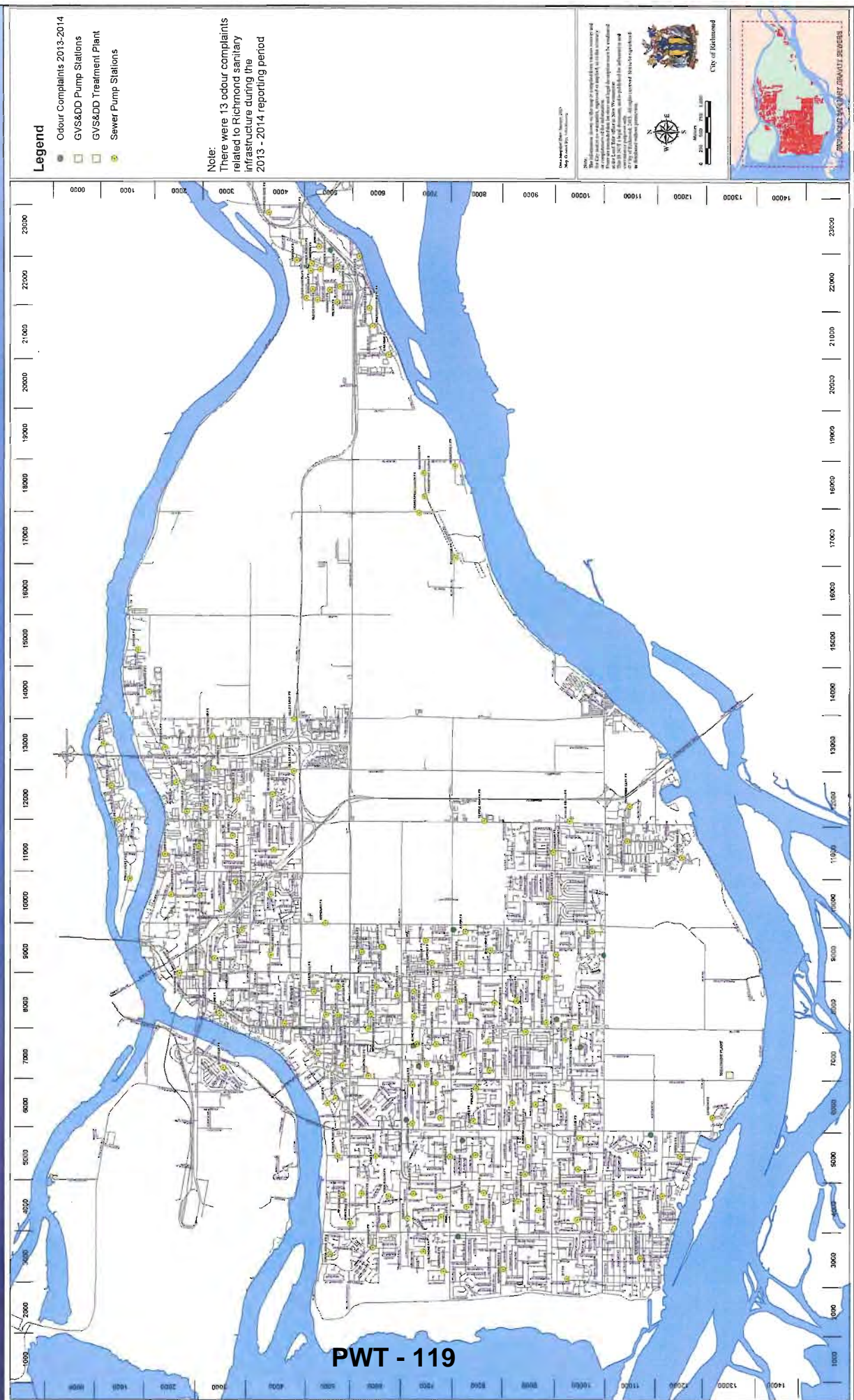
Table 10 Summary of Municipal Progress 2013-2014

| Description | Unit | Total as of Dec 31 st , 2012 | Additions & Changes | Total as of Dec 31 st , 2014 |
|--|------|--|------------------------|---|
| 1. Municipal Sewer System Inventory | | | | |
| a. Sanitary Gravity Sewers | m | 467,324 | -2,868 | 464,456 |
| b. Sanitary Services (Connections) | ea. | 31,591 | -71 | 31,520 |
| c. Sanitary Force mains | m | 104,553 | -3,543 | 101,010 |
| 2. Combined Sewer System Inventory | | | | |
| a. Total Combined Sewers | m | 0 | 0 | 0 |
| b. Combined Services (Connections) | ea. | 0 | 0 | 0 |
| c. Combined Sewers Separated | m | 0 | 0 | 0 |
| d. Percentage of total system separated | % | 0 | 0 | 0 |
| 3. Sanitary Sewer System Evaluation Program | | | | |
| a. Sanitary Sewers Video Inspected | m | 417,300 | 0 | 417,300 |
| b. Percentage of Entire Municipal Sewer System Dye & Smoke Tested | % | 0.7% | 0 | 0.7% |
| c. Percentage of Entire Municipal Sewer System Video Inspected | % | 89.7% | 0 | 89.7% |
| d. Percentage of Entire Municipal Sewer System Structurally Rated | % | 89.7% | 0 | 89.7% |
| 4. Sewer System Rehabilitation | | | | |
| a. Total Length of Sewers Rehabilitated | m | 2,584 | 0 | 2,584 |
| b. Total Length of Sewers Replaced/Capacity Upgraded | m | 10,390 | 950 | 11,340 |
| c. Total Number of Service Laterals Rehabilitated | ea. | 32 | 8 | 40 |
| d. Number of Structurally Repaired Manholes/Cleanouts | ea. | 2331 | 448 | 2,779 |
| e. Number of Cross-Connections Corrected | ea. | 7 | 0 | 7 |
| 5. Sanitary Sewer Overflows | | | | |
| a. Total Number of Reported Dry Weather SSOs | ea. | 0 | 0 | 0 |

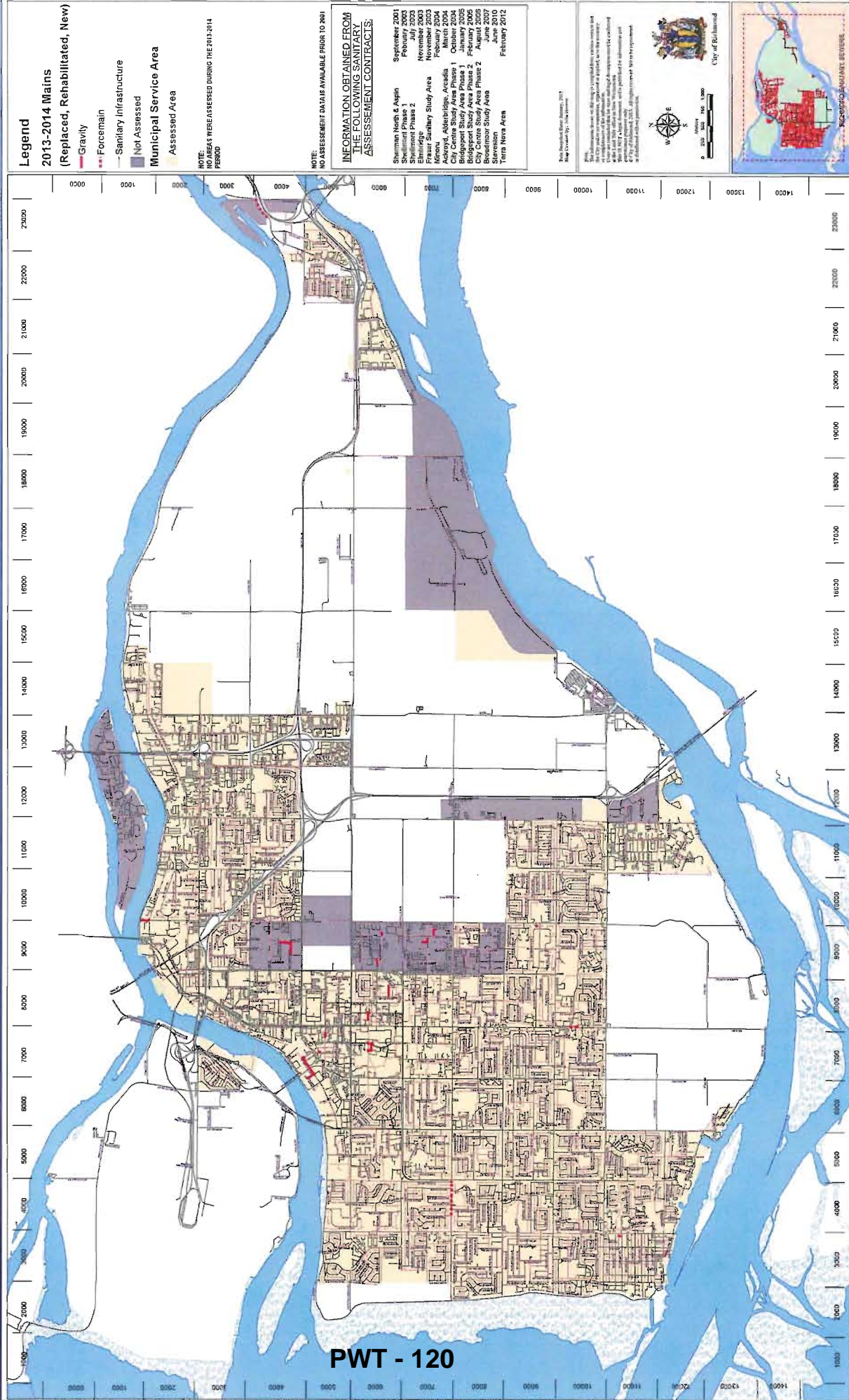
| Description | Unit | Total as of Dec 31 st , 2012 | Additions & Changes | Total as of Dec 31 st , 2014 |
|---|--------------------|--|------------------------|---|
| b. Total Number of Reported Wet Weather SSOs | ea. | 0 | 0 | 0 |
| c. Number of Breakdowns from Failures | ea. | 117 | 9 | 126 |
| 6. Greenhouse Gas Emissions | | | | |
| a. CO ₂ emission reduction from sewer system | kg CO ₂ | N/A | N/A | N/A |
| 7. Summary of Costs | | 2013 | 2014 | Total |
| a. Sanitary Sewer Condition Evaluation Program | | 0.75M | 0.41M | 1.16M |
| b. Combined Sewer Separation Program | | 0 | 0 | 0 |
| c. Sewer System Rehabilitation Program | | 0.37M | 0 | 0.37M |
| d. CO ₂ Reduction Program | | 0 | 0 | 0 |
| e. ISMP Implementation | | 0 | 0 | 0 |
| f. Total Cost for the Biennial Period | | 1.12M | 0.41M | 1.53M |

10557638





Richmond City of Richmond Sanitary Sewer Assessment, Replacement & Rehabilitation January 2015



Legend

- 2013-2014 Mains (Replaced, Rehabilitated, New)
- Gravily
- Forcemain
- Sanitary Infrastructure
- Not Assessed
- Municipal Service Area
- Assessed Area

NOTE: NO AREAS WERE ASSESSED DURING THE 2013-2014 PERIOD

NOTE: NO ASSESSMENT DATA IS AVAILABLE PRIOR TO 2001

INFORMATION OBTAINED FROM THE FOLLOWING SANITARY ASSESSMENT CONTRACTS:

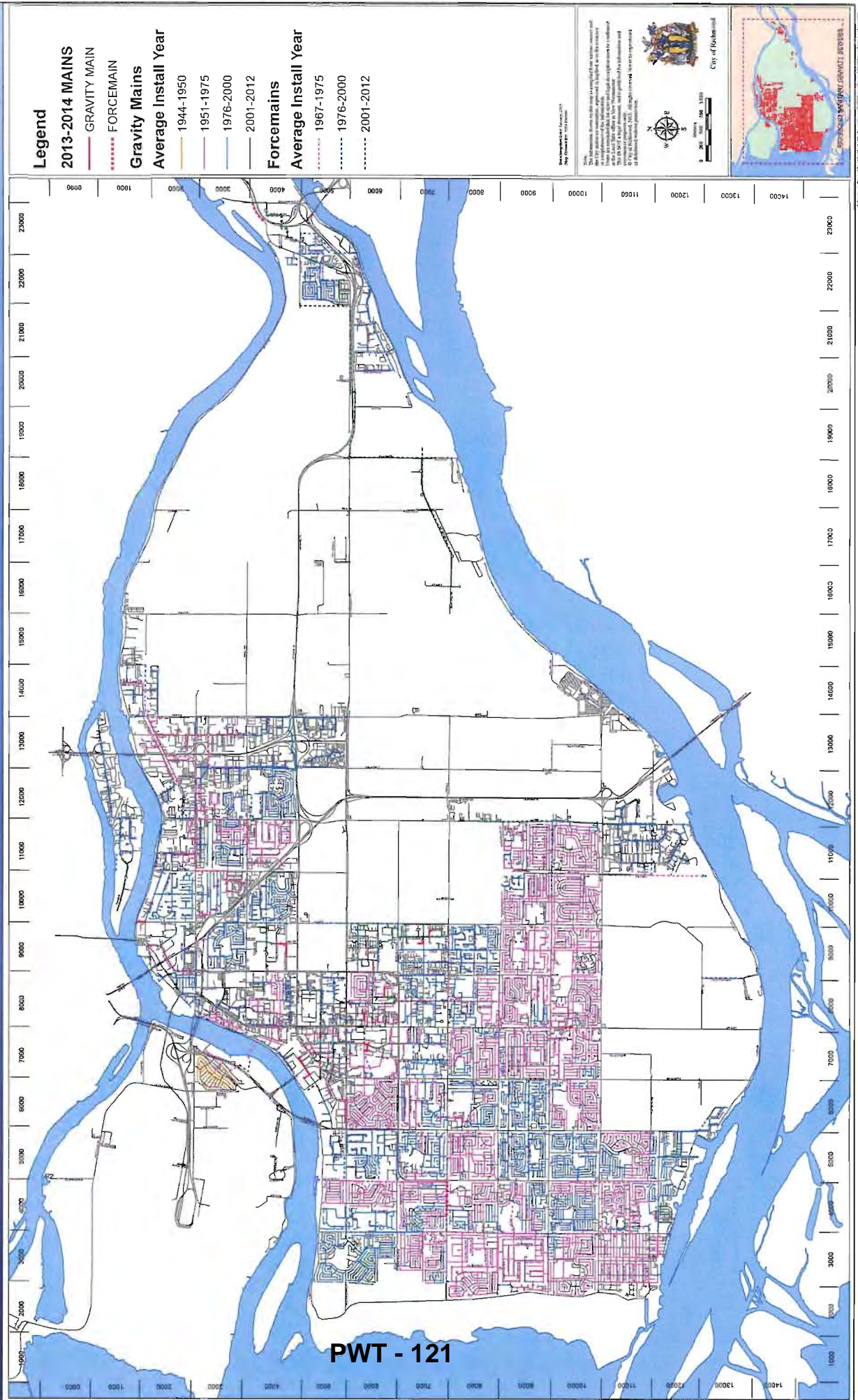
| | |
|----------------------------------|----------------|
| Sherman North & Aspen | September 2001 |
| Shelton Phase 1 | February 2002 |
| Shelton Phase 2 | February 2002 |
| Elmer Ridge | November 2003 |
| Fraser Sanitary Study Area | November 2003 |
| Adairville, Alderbridge, Arcadia | February 2004 |
| City Centre Study Area Phase 1 | March 2004 |
| City Centre Study Area Phase 2 | October 2004 |
| City Centre Study Area Phase 3 | January 2005 |
| City Centre Study Area Phase 4 | February 2005 |
| City Centre Study Area Phase 5 | August 2005 |
| Broadmoor Study Area | June 2007 |
| Stevenson | June 2010 |
| Terra Nova Area | February 2012 |

City of Richmond, 2015

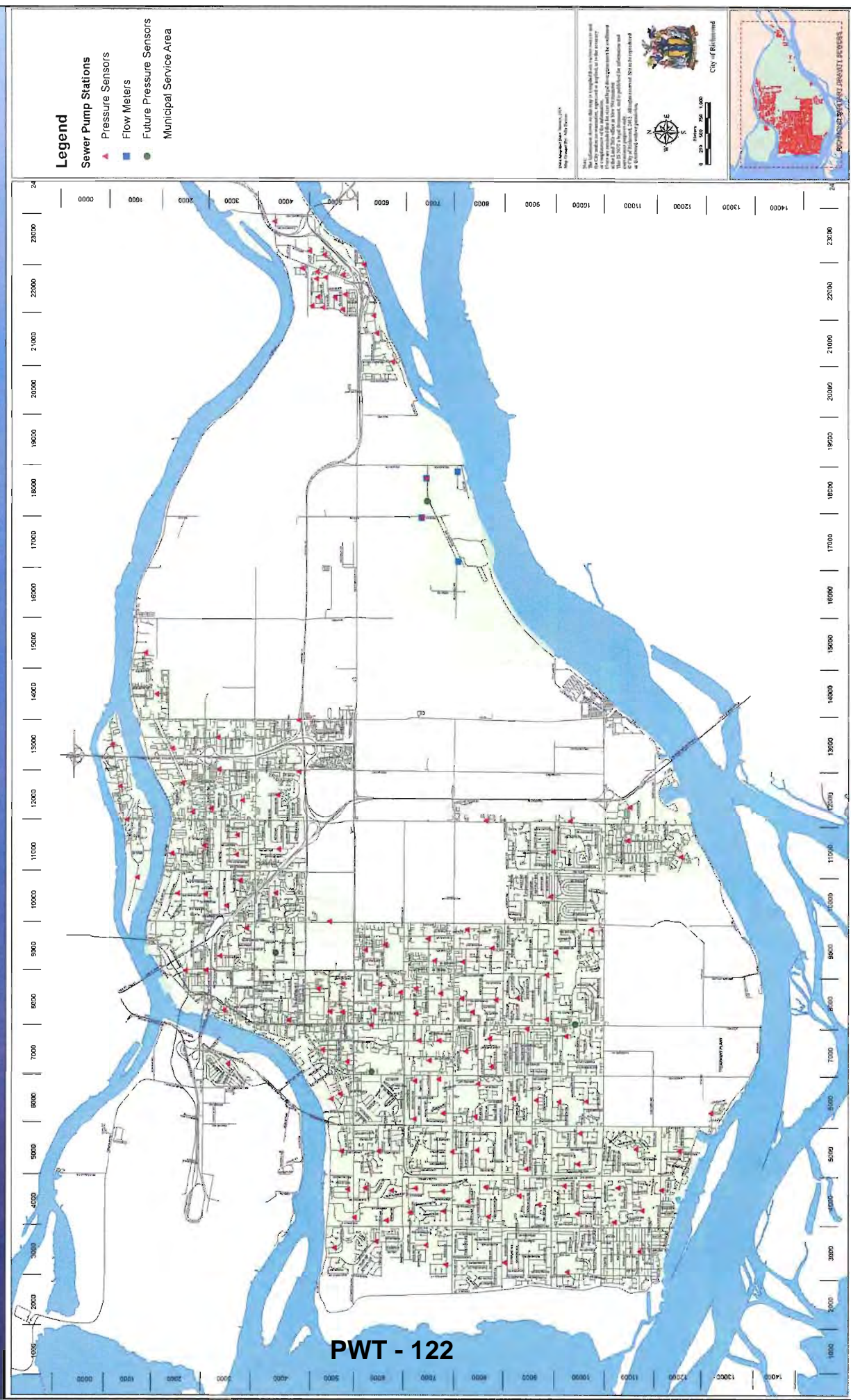
This map is a representation of the City of Richmond's sanitary sewer system and is not a legal document. It is intended for informational purposes only. The City of Richmond is not responsible for any errors or omissions in this map. The City of Richmond is not responsible for any damages or losses resulting from the use of this map. The City of Richmond is not responsible for any claims or liabilities arising from the use of this map.



City of Richmond Sanitary System Age - January 2015



City of Richmond Active Sewer Flow & Level Monitors - January 2015



Richmond Integrated Stormwater Management Plan (ISMP) Status Map - January 2015



Legend



Implementation Phase

Note:
Richmond is developing
one ISMP for the entire
City that will meet the Liquid
Waste Management Plan
(LWMP) requirements.

City of Richmond
Richmond, Virginia
January 2015

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City of Richmond

